

Protagonism of health academics in the production of personal protective equipment during the COVID-19 pandemic: experience report

Protagonismo de los académicos de la salud en la producción de equipos de protección personal durante la pandemia de COVID-19: relato de experiencia

Protagonismo de académicos da saúde na produção de equipamentos de proteção individual durante a pandemia da COVID-19: relato de experiência

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Abstract

The COVID-19 pandemic caused one of the biggest health crises of the 21st century. In the first half of 2020, the world experienced a lack of Personal Protective Equipment (PPE). In Acre, students from the Federal University of Acre mobilized and created the Episcovid-19 project. The aim of this work is to describe the production of PPE, distribution in health units, as well as the motivation of those involved in the process. This is a qualitative and quantitative study of the type of experience report carried out through semi-structured interviews. In 6 months, more than 120,000 PPE, including aprons, clips and face shields, were produced and distributed in various health units in Acre, covering several frontline health professionals and municipalities in the state. The EPISCOVID-19 project surpassed all the initially planned goals, which were 5,000 pieces of equipment, producing more than 125,000 PPE. The importance of the social responsibility of public universities in Brazil is highlighted, which contributed in different ways to society during the COVID-19 Pandemic, mainly through the University Extension axis, having a significant role in articulation with civil society entities in the fight and SARS-CoV-2 prevention.

Descriptors: Personal Protective Equipment; Pandemic; COVID-19; Universities; Social Responsibility.

Resumen

La pandemia de COVID-19 provocó una de las mayores crisis sanitarias del siglo XXI. En la primera mitad de 2020, el mundo experimentó una falta de Equipo de Protección Personal (EPP). En Acre, estudiantes de la Universidad Federal de Acre se movilizaron y crearon el proyecto Episcovid-19. El objetivo de este trabajo es describir la producción de EPP, la distribución en las unidades de salud, así como la motivación de los involucrados en el proceso. Se trata de un estudio cualitativo y cuantitativo del tipo relato de experiencia realizado a través de entrevistas semiestructuradas. En 6 meses, se produjeron y distribuyeron más de 120.000 EPP, incluidos delantales, clips y protectores faciales, en varias unidades de salud en Acre, cubriendo varios profesionales de la salud y municipios de primera línea en el estado. El proyecto EPISCOVID-19 superó todas las metas previstas inicialmente, que eran 5.000 equipos, produciendo más de 125.000 EPI. Se destaca la importancia de la responsabilidad social de las universidades públicas de Brasil, que contribuyeron de diferentes formas a la sociedad durante la Pandemia del COVID-19, principalmente a través del eje Extensión Universitaria, teniendo un papel significativo en la articulación con entidades de la sociedad civil en la lucha contra el SARS -Prevención CoV-2.

Descriptoros: Equipo de Protección Individual; Pandemia; COVID-19; Universidades; Responsabilidad Social.

Resumo

A Pandemia da COVID-19 provocou uma das maiores crises sanitárias do Século XXI. No primeiro semestre de 2020, o mundo vivenciou a falta de Equipamentos de Proteção Individuais (EPIs). No Acre, alunos da Universidade Federal do Acre se mobilizaram e criaram o projeto Episcovid-19. O objetivo deste trabalho é descrever a produção dos EPIs, a distribuição nas unidades de saúde, bem como a motivação dos envolvidos no processo. Trata-se de um estudo quali-quantitativo do tipo relato de experiência realizado por meio de entrevistas semiestructuradas. Em 6 meses, mais de 120 mil EPIs, entre aventais, clips e protetores faciais foram produzidos e distribuídos em várias unidades de saúde acreanas, contemplando diversos profissionais de saúde da linha de frente e municípios do estado. O projeto EPISCOVID-19 superou todas as metas previstas inicialmente que eram de 5 mil equipamentos, produzindo mais de 125 mil EPIs. Destaca-se a importância da responsabilidade social das universidades públicas do Brasil, as quais contribuíram de diversas formas à sociedade durante a Pandemia da COVID-19, principalmente pelo eixo de Extensão Universitária, tendo um papel significativo de articulação com entidades da sociedade civil no combate e prevenção ao SARS-CoV-2.

Descriptoros: Equipamento de Proteção Individual; Pandemia; COVID-19; Universidades; Responsabilidade Social.



Introduction

COVID-19 is an infectious syndrome caused by the new coronavirus, called SARS-CoV-2, which was identified as the cause of an outbreak of viral pneumonia of unknown origin in the city of Wuhan, Hubei province, China, in December 2019. On March 11, 2020, due to the expansion of the outbreak worldwide, the World Health Organization (WHO) characterized the situation as a pandemic and, since then, the entire globe has experienced one of the greatest health challenges of this XXI century¹⁻³.

Since 2020, the number of confirmed and suspected cases has increased significantly, especially during outbreak waves. At the beginning of the pandemic, the WHO did not have a specific contingency plan to contain the growth in the number of deaths and infected people, given that the disease was still a novelty for the scientific community⁴.

The current scenario of the disease, at the beginning of 2022, shows that the pandemic continues with new waves of outbreaks that afflict several regions of the globe, being driven by new mutagenic variants. The world, based on Science, has responded to the situation at a speed never seen in the past, with the production of vaccines, new technologies and promoting studies that have had a significant impact on hospitalizations and deaths, according to statistics that point favorably to their reductions⁴.

The transmission of the pathogen occurs mainly horizontally, between individuals, through inhalation of respiratory secretions (by sneezing, coughing and even speaking), as well as through contact with fomites and/or contact with the contaminated hand. with mucous membranes (such as eyes, nostrils and mouth). In addition, there are reports on the possibility of feco-oral transmission⁵.

In this context, it is essential for health professionals, who are at the forefront of care for contaminated patients, to use PPE, such as masks (surgical, N95, FFP2), gloves, aprons, goggles, and faceshield to prevent both contamination and infection of the professional, as well as the spread of the disease in that health unit, thus reducing transmission and ensuring the continuity of care and the very maintenance of the health system⁶.

After the first confirmed cases in Brazil, on February 26, 2020, the high transmissibility of the virus made evident the flaws in Brazilian health services in relation to the safety of frontline teams. Care professionals have routinely faced precariousness in the work process and numerous problems of access to resources, such as lack of PPE, infrastructure, scarcity of supplies, inadequate staffing, lack of human resources training and long working hours⁷.

The importance of protecting health professionals in their work environment is undeniable. Since the beginning of the pandemic, there have been reports of countless infected professionals who have died. In Italy, for example, in April 2020, 1,691 health professionals tested positive for COVID-19, representing 10.7% of the total cases, and there was a record, on the same date, of 119 deaths of doctors, 34 nurses and 17 nursing technicians. In Brazil, in May 2020, there were already 31,790 professionals infected, and of

these, the majority were nursing technicians (34.2%) and nurses (16.9%)^{8,9}.

Embora os EPIs tornaram-se questão crucial durante the COVID-19 pandemic, its global stock went through a series of shortages due to growing global demand, competition between countries for these inputs and the limited capacity to expand industrial production. Similarly, the Brazilian scenario did not differ from the global situation in relation to the availability and access to this equipment, with the aggravating factor of the need to import them. In this context, the Associação Médica Brasileira (AMB) received, until April 22, 2020, more than 3,200 reports of lack of PPE in health units in various regions of the country. In addition, due to the increase in demand, there was also an increase in the price of products and reports of abusive prices¹⁰⁻¹².

In the state of Acre there were also shortages of this equipment, according to the complaint by the Regional Council of Medicine (CRM-AC), in June 2020, to the Ministry of Labor, reporting the lack of PPE for frontline care professionals. There is also the aggravating factor that, in Acre, there is no local production of any material of this nature, requiring purchase in large centers¹³.

Since the beginning of the pandemic, public universities have not completely stopped their activities. Many civil servants and academics joined together with the population to promote intervention actions in this moment of emergency, mainly through extension and research projects¹⁴.

The University of São Paulo (USP) has developed projects aimed at making safe masks using alternative high-performance material for intensive care professionals, as well as the production of faceshields and headbands, prototypes of masks with the possibility of reuse and production of PPE, in general, to meet the demand of professionals in hospitals¹⁵.

At the Federal University of Roraima (UFRR), the project "Facing the Situation of Crisis in Health" was developed, which manufactured and distributed PPE to hospitals in the region and provided training on coping with the COVID-9 pandemic to academics. The Federal University of Rio Grande (FURG), the State University of Bahia (UNEB) and the Sholokhov Institute, in Moscow, produced faceshield masks for individual use. The "Blue Mask - A98" project was developed by volunteers from the Fashion and Nursing courses at the State University of Londrina (UEL), and also produced high-protection surgical masks for professionals at the University Hospital¹⁶⁻²⁰.

Like the other Universities mentioned, at the Federal University of Acre (UFAC) there was mobilization of medical students who outlined an extension project called "EPISCOVID-19", whose objective was to produce PPE for health professionals in the capital Rio Branco, mainly those who worked on the front line in the health units, aiming to help meet the demand for this equipment that was in short supply in the state and in the rest of the country. In this context, the present study aimed to describe the production of these PPE, their distribution in health units in Acre, as well as the motivation of those involved in the process.



The guiding questions were: How did the EPISCOVID-19 project start? Who participated in the project? What motivated the students to start the project? How was the daily organization for the manufacture of PPE carried out? How many PPEs were distributed? What is the contribution of the project to health professionals?

Methodology

The study design consisted of a qualitative and quantitative research of the experience report type²¹. The quantitative design raised the amount of PPE produced and donated by type of equipment, the locations and the number of professionals who received the donation.

As for the study location and population, semi-structured interviews were carried out, mostly in a virtual way, through the Google Meet platform, with 10 students from the UFAC Medicine course who were part of the EPISCOVID-19 project. The project's teaching coordinator was interviewed, as well as another health professional to ratify the information (total of 12 interviews).

The inclusion criteria for the students interviewed were: having participated in at least two stages of the action's execution (conception, disclosure for collection, production of PPE and/or distribution). Sampling was purposeful²².

The interviews were carried out aiming to elucidate the following questions: What are the students' motivations for the creation and execution of the project? What are the perceptions of the students involved in the project?

Regarding the analysis of the information, an analytical approach was applied to the content of the interviews to generate an inference, description and interpretation of the facts²³. Furthermore, based on the students' interviews, production and donation control worksheets were obtained, and such data were tabulated and analyzed in absolute and relative frequencies.

This study was submitted to the Research Ethics Committee (CEP) of the Federal University of Acre, receiving a favorable opinion, with protocol number: 4,288,275 and followed Resolution n.º 466/12 of the National Health Council (CNS). No data and/or information identifying the participant involved was exposed.

Experience Report

The EPISCOVID-19 project began at the beginning of the COVID-19 pandemic, in March 2020, motivated by the shortage of PPE for health professionals in the state of Acre, with a production target of 5,000 pieces of equipment.

Two students from the UFAC medical course started the equipment prototypes and, with the collaboration of a professor from the course, the project gained support from various civil society organizations. Soon after, the project was institutionalized as an Extension project by UFAC, with 10 scholarship holders and countless other volunteer students, also including nursing students from the

institution. For the artisanal production of PPE, the project raised cash donations from dissemination through social networks. Thus, they obtained approximately 100 thousand reais in donations and an appeal from the Rod of Penal Executions and Alternative Measures of the District of Rio Branco (VEPMA), in the amount of 63 thousand reais²⁵.

With the resources acquired, the students produced, in 5 months of project, a total of 126,043 units of PPE, with May and June being, respectively, the months with the highest production, according to Table 1 and illustrated by Figure 1.

Table 1. Monthly production of PPE by students of the EPISCOVID-19 extension project. Rio Branco, AC, Brazil, 2020

Month/2020	Monthly production of PPE *
	(units)
March	6.131
April	28.770
May	43.428
June	33.274
July	12.444
August	1.996
TOTAL	126.043

Note: *PPE: personal protective equipment.

The PPE produced were: plastic apron; non-woven fabric apron (TNT); 3D clips; face shield; Official 3D protector; and 3D Prototype protector. The most produced PPE were non-woven and plastic aprons, which together consisted of 108,537 units (86% of total PPE production), as shown in Table 2 and illustrated by Figure 2.

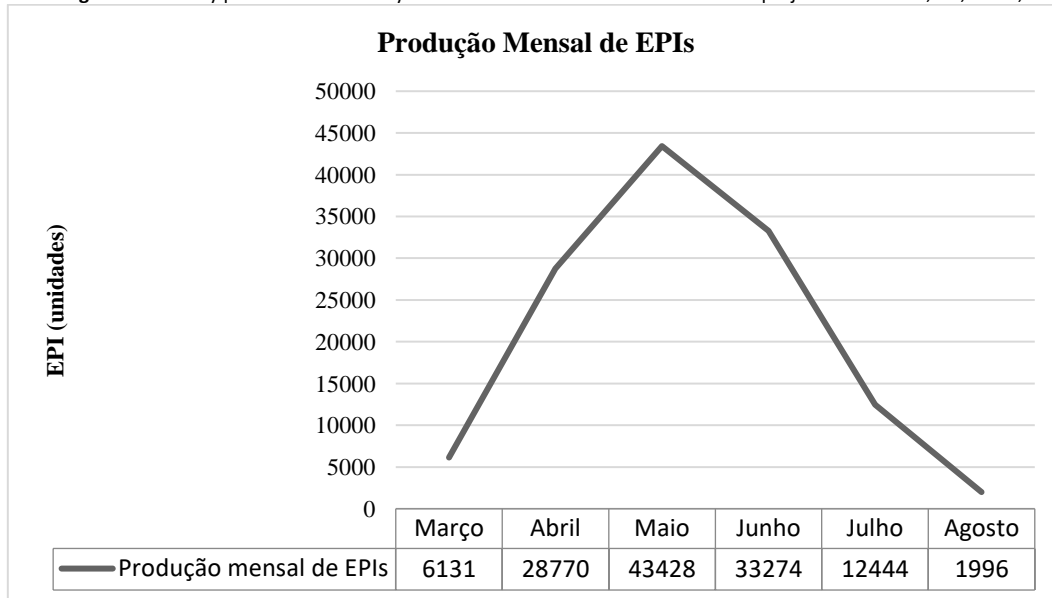
Table 2. Type of PPE produced by students of the EPISCOVID-19 extension project. Rio Branco, AC, Brazil, 2020

PPE*	Total produced
	(units)
Plastic apron	56.265
TNT apron	52.272
3D clips	199
Face shield	7.136
Official 3D Protector	10.016
3D Protector Prototype	155
Total	126.043

Note: *PPE: personal protective equipment.

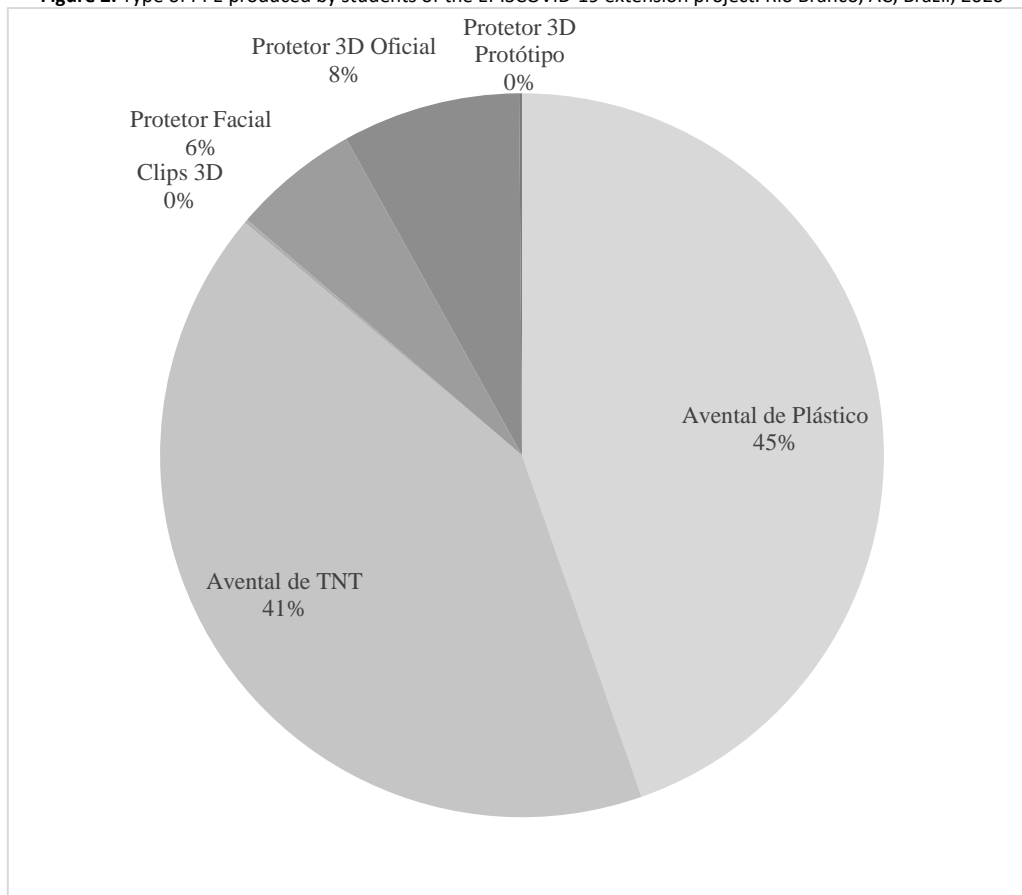


Figure 1. Monthly production of PPE by students of the EPISCOVID-19 extension project. Rio Branco, AC, Brazil, 2020



Note: *PPE: personal protective equipment.

Figure 2. Type of PPE produced by students of the EPISCOVID-19 extension project. Rio Branco, AC, Brazil, 2020



Note: *PPE: personal protective equipment. **TNT: tissue non-tissue.

All PPE produced in the project's 6 months (more than 125,000) were distributed to various health units in the state. In the capital of Rio Branco, more than 90,000 units were distributed, mainly for the Hospital Foundation of Acre (FUNDHACRE), the Hospital de Urgência e Emergência de Rio Branco (HUERB), the Emergency Care Unit (UPA) of 2nd District (at the time, the reference unit for COVID-19) and the Municipal Health Secretariat (which redistributed it to

the municipal health units). In addition to the capital, virtually all other municipalities in Acre also received PPE produced by the Episcovid-19 project. Several frontline professionals received the equipment and had their demand met by the project's PPE during these months.

It is worth mentioning that, for this production, a company structure was installed on the premises of UFAC, due to the high responsibility and the need for logistics



similar to the factories, with divisions of warehouse, production, distribution, finance, projects and sectors of teaching for new volunteers. Each of these sectors had a student coordinator responsible for controlling all activities carried out, from the purchase of raw materials to the delivery of equipment to health professionals, according to the following report (Interviewee 1):

"[...] we shared the coordination tasks. We have a person who is responsible for the warehouse and delivery of the material, another was in charge of general services and projects, I was in charge of making plastic aprons and TNT, another volunteer was in the making department of facial protectors, and there is also a boy who was responsible for finance. He was responsible for issuing invoices, paying invoices, all this financial inspection for the purchase of material, we had to bring things from São Paulo and there was shipping, he was responsible, it was the Ministry of Health, so there were five people right, each one responsible for a specific area [...]" (Interviewee 1).

The selection of participants and team divisions were carried out according to criteria of exposure and risk, skills and availability of participants, as stated in the following excerpt (Interviewee 2):

"[...] people before helping us, they went through a check-up list, like that, the girls who worked from home did it, they called them, people and checked if they had all the requirements of us, if they didn't have any symptom, of not living with people from the risk group and such, and when these people got there, we shared it too, there was the board, there were coordinators, there were supervisors and monitors too [...] then each person it kind of fit into an activity and they had the girls who worked making the scales and then there were several groups, we had more than twenty groups of different activities and the volunteers made the scales, she called the person and asked in the group what the activity that the person felt most confident in doing" (Interviewee 2).

During the period from March to August, the project became the main supplier of equipment for hospital units, state departments and institutions such as Lar dos Vicentinos (home for the elderly). With the constant increase in demand, volunteers were joining the team, coming from courses in the health area, such as nursing, nutrition, psychology and collective health, and from sectors of society, such as: army and employees of partner companies.

The manufacture of protective equipment was duly separated into stages previously established by the coordinators, with strategies aimed at continuing the quality and speed of manufacture and, especially, at guaranteeing the physical health of the volunteers. Such steps included the purchase of material, separation of teams for each piece of equipment, in which they had different stages of manufacture, the preparation of invoices, storage of equipment with the date and place of manufacture and the material from which it was produced, then were distributed according to the demands of the state, as described below (Interview 3):

"[...] in the area of facial protectors, we started with the boys making the purchase line for material acquisition of the material, in fact, it all started with donations, we received the money from

Silva CAA, Cardoso KLS, Cardoso HETA, Prado PR, Rocha DS donations [...] then it was directed, the TNT went there to UFAC, we had a TNT storage room, which we distributed in the knitting shops, [...] and basically that's it, we had donations, we had purchases with invoices for us to account for later. for the community, as for Organs public bodies that made the donations, and then it was directed to the storage, identification of this material, that we had to quantify all the material and then direct it to the production line, then after production they were packaged, identified per day of production, place of production and the material from which it was produced, and stored in the warehouse in boxes, everything correctly, and then it was distributed according to the demand of the state, of our priorities, we had around five priorities to distribute this material and everything identified only left the place with the signature of the person who took it, everything identified to know that it was from the project and everything was documented [...]" (Interviewee 3).

At the beginning of the project, fundraising was carried out through online crowdfunding, requests for donations of material, later, the project creators submitted the proposal for public notices by the Public Ministry and the Court of Justice, as reported by Interviewee 4:

"[...] it was all donations, so much so that we were able to buy with donations, and we also distributed with donations, we did not have financial support from the city hall or the state, we managed that way, the population that helped us, the Public Ministry that helped us, the Court of Justice [...]" (Interviewee 4).

Such requests ensured sufficient funds for the maintenance and advancement of production, along with the donations came financial responsibilities for sending invoices and controlling expenses, just like an authentic company.

With the growth of the project and increasingly intensified production, academics reported the main difficulties faced during the production period, such as: insufficient financial resources or government support, scarcity of raw materials, being necessary to make purchases from other states, there was also a lack of manpower, even with times when the production had a high number of volunteers (reaching, at times, 40 volunteers) and supporters of local companies, interpersonal relationships were also mentioned, during the narratives, as challenges, due to fatigue, stress and overload attributed to excessive responsibilities and full dedication to clothing, since at certain times students spent up to 12 hours in the production area, being highlighted in the following report (Interviewee 5):

"[...] so, like, we grew a lot and production increased, and a lot of people helping, a lot of people leaving and entering, many problems, we went through many difficulties, many conflicts, it was very complicated, there were no flowers all the time, but it was fundamental to our growth. We organized ourselves as a company, we transformed the medical campus into a company, an industry, because we produced plastic aprons morning and afternoon, we were there on some days until night too, so it was very busy, but we learned a lot [...] Wow! We ran a lot of risk, like, of getting sick, of exhaustion, of stress, of abdication, of traveling to our homes, many people stayed in Rio Branco to help" (Interviewee 5).

Even with the problems faced during the process, the EPISCOVID-19 project carried out several actions, in



addition to making PPE, and was even described as a teaching-learning movement for academics, who found themselves carrying out business work to request resources and provide of bills. They also produced videos for other universities in states such as Bahia, São Paulo, Rondônia and Roraima, teaching volunteers from these regions to produce their equipment to carry out similar projects, in addition to the team's performance in training for professionals where they would teach about ways to correct use and disposal of these equipment, in order to avoid contamination by improper handling. The project also highlights the social responsibility of the public university in combating the COVID-19 Pandemic and highlights the importance of the University Extension axis to establish dialogues and expand the frontiers of Science for the benefit of society, thus promoting scientifically reliable information, innovation and technology and community support^{14,26}.

Finally, to reinforce the relevance of this project in supporting public health services, a member of the management of the State Health Department was also interviewed to confirm receipt of the equipment. She endorsed that the project was essential for assisting the first cases of COVID-19 and protecting health professionals,

since, in the first months of 2020, it was only the materials donated by the project that the secretariat was willing to provide to health units.

Conclusion

The importance of the social responsibility of public universities in Brazil is highlighted, which contributed in different ways to society during the COVID-19 Pandemic, mainly through the University Extension axis, having a significant role in articulation with civil society entities in the fight and SARS-CoV-2 prevention. The EPISCOVID-19 extension project, designed by medical students at UFAC and with the support of a professor from the course, managed to produce more than 125,000 PPE in just 5 months, practically meeting most of the demand in the state of Acre and surpassing all the goals initially set, which were 5,000 pieces of equipment produced.

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